CLAIMS

What is claimed is:

1. A power factor correcting power supply comprising:

a first boost converter that includes a first boost sub-circuit coupled with a second boost sub-circuit;

a second boost converter coupled in series with the first boost converter, where the second boost converter includes a third boost sub-circuit coupled with a fourth boost sub-circuit,

where the first and second boost converters are configured to receive an input voltage and supply a boost voltage; and

a power factor correction controller coupled with the first and second boost converters, where the power factor correction controller is configured to control the first and second boost converters with interleave as a function of the boost voltage.

2. The power factor correcting power supply of claim 1, where the first and second boost sub-circuits are coupled in series and the third and fourth boost sub-circuits are coupled in series.

3. The power factor correcting power supply of claim 1, where the power factor correction controller is configured to control the first and second boost converters with interleave of at least four.

4. The power factor correcting power supply of claim 1, where the each of the first, second, third and fourth boost sub-circuits include a boost switch, the boost switch of each of the first, second, third and fourth boost sub-circuits coupled in series and configured to be coupled in parallel with an input voltage.

5. The power factor correcting power supply of claim 1, where each of the first, second, third and fourth boost sub-circuits include a respective boost switch and a respective boost capacitor, the respective boost capacitor being chargeable by the respective boost switch to a portion of the boost voltage.

6. The power factor correcting power supply of claim 1, where the first boost converter includes a first boost capacitor and the second boost converter includes a second boost capacitor, the first and second boost sub-circuits configured to charge the first boost capacitor to a portion of the boost voltage and the third and fourth boost sub-circuits configured to charge the second boost capacitor to a portion of the boost voltage.

7. The power factor correcting power supply of claim 1, where each of the first, second, third and fourth boost sub-circuits include respective boost switches, each of the boost switches are independently switchable by the power factor correction controller with a double edge natural pulse width modulated triangle wave that is scaleable by the power factor correction controller based on the boost voltage.

8. A power factor correcting power supply comprising:

an input stage power converter that includes at least four boost switches coupled in series, the at least four boost switches configured to be coupled in parallel with an input voltage; and

a power factor correction controller coupled with the at least four boost switches, the power factor correction controller configured to direct the at least four boost switches independently with interleave to provide a DC boost voltage from the input voltage,

where the power factor correction controller is configured with feedforward control to direct the at least four boost switches as a function of the DC boost voltage.

9. The power factor correcting power supply of claim 8, where the input voltage and the DC boost voltage is divided about equally between each of the at least four boost switches.

10. The power factor correcting power supply of claim 8, further comprising an output stage power converter coupled with the input stage power converter, where the output stage power converter includes a first output converter and a second output converter.

11. The power factor correcting power supply of claim 10, where the first output converter is coupled in parallel with a first pair of the at least four boost switches and the second output converter is coupled in parallel with a second pair of the at least four boost switches.

12. The power factor correcting power supply of claim 11, where the output stage power converter is configured to substantially balance an output voltage of the first and second pairs of the at least four boost switches.

13. The power factor correcting power supply of claim 10, where each of the first and second output converters includes a switch mode converter, a transformer and a bridge rectifier to convert the DC boost voltage to a DC output voltage that is isolated from the DC boost voltage.

14. The power factor correcting power supply of claim 10, where each of the first and second output converters comprises a fixed frequency non-regulating half-bridge chopper.

15. The power factor correcting power supply of claim 8, where the input stage power converter includes at least four respective boost sub-switches configured to operate in time alternation with the respective at least four boost switches.

16. The power factor correcting power supply of claim 8, where the input voltage is an AC input voltage and two of the at least four boost switches are configured as a first full bridge converter and two of the at least four boost switches are configured as a second full bridge converter.

17. The power factor correcting power supply of claim 8, further comprising a bridge rectifier coupled with the input stage power converter, where the bridge rectifier is configured to provide a rectified AC input voltage as the input voltage to the input stage power converter.

18. The power factor correcting power supply of claim 8, further comprising a synchronous rectifier coupled with the input stage power converter, where the synchronous rectifier is configured to supply a rectified AC input voltage as the input voltage to the input stage power converter and receive an output voltage from the input stage power converter.

19. A power factor correcting power supply comprising:

an input stage power converter that includes a power factor correction controller and a first boost converter coupled in series with a second boost converter, where the first and second boost converters are controlled with interleave by the power factor correction controller to supply a DC boost voltage and to control a wave shape of an AC input current supplyable to the power factor correcting power supply by a power source; and

an output stage power converter coupled with the first and second boost converters, where the output stage power converter is configured to balance the boost voltage supplied with the first and second boost converters.

20. The power factor correcting power supply of claim 19, where the output stage power converter includes a first output converter and a second output converter, the first output converter coupled with the first boost converter, and the second output converter coupled with the second boost converter.

21. The power factor correcting power supply of claim 20, where the first and second output converters are configured to balance a voltage contribution to the DC boost voltage from each of the first and second boost converters.

22. The power factor correcting power supply of claim 19, where the first and second boost converters each include a plurality of boost sub-circuits coupled in series, where each of the boost sub-circuits include a boost switch.

23. The power factor correcting power supply of claim 19, where the first and second boost converters are controlled by the power factor correction controller with frequency modulation to reduce electromagnetic interference.

24. The power factor correcting power supply of claim 19, where the output stage power converter includes a fixed frequency switch mode power converter and a transformer, the fixed frequency switch mode power converter configured to provide a DC output voltage to a DC rail, and the transformer having galvanic isolation to minimize switching noise of the first and second boost converters.

25. The power factor correcting power supply of claim 19, where the output stage power converter includes an output converter and an output filter configured to convert the DC boost voltage to a DC output voltage supplyable to a load.

26. The power factor correcting power supply of claim 25, where the power factor controller is configured to regulate the DC output voltage as a function of the DC boost voltage and the DC output voltage.

27. The power factor correcting power supply of claim 25, where the power factor correction controller is configured to regulate the DC output voltage as a function of the DC boost voltage, the DC output voltage and the AC input current.

28. A power factor correcting power supply comprising:

an input stage power converter that includes a first pair of boost switches coupled in series and a second pair of boost switches coupled in series, where the first and the second pair of boost switches are coupled in series;

means for controlling power factor coupled with the first and the second pair of boost switches, the means for controlling power factor configured to control each

of the first and the second pair of boost switches with interleave to provide a portion of a boost voltage; and

an output stage power converter coupled with the input stage power converter, where the output stage power converter includes a first output converter coupled with the first pair of boost switches and a second output converter coupled with the second pair of boost switches, where the output stage power converter is configured to substantially balance the portion of the boost voltage provided by each of the first and the second pair of boost switches.

29. The power factor correcting power supply of claim 28, where the input stage power converter includes an inductor and a plurality of boost capacitors that are coupled with the first and the second pair of boost switches, the first and the second pair of boost switches switchable to magnetize the inductor and charge the boost capacitors.

30. The power factor correcting power supply of claim 29, where the first pair of boost switches are cooperatively switchable to charge a first boost capacitor and the second pair of boost switches are cooperatively switchable to charge a second boost capacitor.

31. The power factor correcting power supply of claim 29, where a first and a second boost switch included in the first pair of boost switches are each switchable to charge a respective first and a second boost capacitor and a third and a fourth boost switch included in the second pair of boost switches are each switchable to charge a respective third and a fourth boost capacitor.

32. The power factor correcting power supply of claim 28, where the input stage power converter includes a first and a second pair of boost sub-switches coupled with the respective first and the second pair of boost switches, the input stage power converter configured to supply power to a power source and consume power from the power source as a function of control by the power factor correction controller.

33. The power factor correcting power supply of claim 28, where the input stage power converter includes a first and a second pair of diodes coupled with the respective first and the second pair of boost switches, the input stage power converter configured to consume power from a power source as a function of control by the power factor correction controller.

34. A power factor correcting power supply comprising:

a first boost switch and a second boost switch, the first and second boost switches coupled in series and configured to be coupled in parallel with an AC power source;

a first boost sub-switch coupled in series with the first boost switch;

a second boost sub-switch coupled in series with the second boost switch;

a boost capacitor coupled across at least one of the first boost switch coupled in series with the first boost sub-switch and the second boost switch coupled in series with the second boost sub-switch; and

a power factor correction controller coupled with the first and second boost switches and the first and second boost sub-switches, where the first and second boost switches and the first and second boost sub-switches are switchable to develop at least a portion of a DC boost voltage on the boost capacitor from an AC input voltage supplyable from the AC power source.

35. The power factor correcting power supply of claim 34, where the boost capacitor is coupled across both the first boost switch and the first boost sub-switch and the boost capacitor is also coupled across the second boost switch and the second boost sub-switch.

36. The power factor correcting power supply of claim 34, where the boost capacitor comprises a first boost capacitor and a second boost capacitor, the first boost capacitor is coupled across the first boost switch and the first boost sub-switch and the second boost capacitor is coupled across the second boost switch and the second boost sub-switch.

37. The power factor correcting power supply of claim 34, where at least a portion of an output stage power converter is coupled in parallel with the boost capacitor.

38. The power factor correcting power supply of claim 34, further comprising an output stage power converter coupled in parallel with the boost capacitor, where the output stage converter includes a switch mode converter, a transformer and an output filter to convert the DC boost voltage to a DC output voltage that is isolated from the DC boost voltage.

39. The power factor correcting power supply of claim 34, further comprising an output stage power converter that includes a non-resonant fixed frequency switch mode converter and an isolation transformer to galvanically isolate the DC boost voltage.

40. A power factor correcting power supply comprising:

a first boost switch coupled in series with a second boost switch, where the first and second boost switches are configured to be coupled in parallel with an AC power source,

a boost inductor coupled with each of the first and second boost switches;

a boost capacitor coupled in parallel with the first and second boost switches,

where the first and second boost switches are switchable to magnetize the boost inductor and charge the boost capacitor when the boost inductor is demagnetized to produce a DC boost voltage on the boost capacitor; and

a power factor correction controller coupled with the first and second boost switches, where the power factor correction controller is configured to control the first and second boost switches with feedforward control based on the DC boost voltage.

41. The power factor correcting power supply of claim 40, where the first and second boost switches are configured to receive an un-rectified AC input voltage.

42. The power factor correcting power supply of claim 40, where the first and second boost switches and the boost capacitor comprise an interleaved full bridge converter.

43. The power factor correcting power supply of claim 40, further comprising a first and second boost sub-switch coupled with the respective first and second boost switches, where the first boost switch and the first boost sub-switch comprise a first half bridge and the second boost switch and the second boost sub-switch comprise a second half bridge.

44. The power factor correcting power supply of claim 43, where the first and second half bridges are coupled in series.

45. The power factor correcting power supply of claim 40, where the first and second boost switches and the boost capacitor are configured to consume power from the AC power source and supply power to the AC power source as directed by the power factor correction controller.

46. The power factor correcting power supply of claim 40, where the power factor correction controller controls the first and second boost switches with interleave of at least two.

47. A method of performing power factor correction with a power factor correcting power supply, the method comprising:

providing an power source having an input voltage and an input current;

interleave switching at least four boost switches that are coupled in series across the power source to convert the input voltage to a first DC voltage;

converting the first DC voltage to a second DC voltage with an output stage power converter; and

supplying the second DC voltage to a power rail to supply a load.

48. The method of claim 47, where interleave switching comprises regulating the second DC voltage to a desired magnitude as a function of the first DC voltage and the second DC voltage.

49. The method of claim 47, where interleave switching comprises substantially matching a waveform of a pulse width modulation voltage supplied to a boost capacitor by at least one of the at least four boost switches to a waveform of the input voltage.

50. The method of claim 47, where interleave switching comprises dividing the input voltage and the first DC voltage between the at least four boost switches.

51. The method of claim 49, where converting the first DC voltage to a second DC voltage comprises substantially balancing division of the first DC voltage between the at least four boost switches.

52. The method of claim 47, where interleave switching comprises creating a pulse width modulation voltage to charge a boost capacitor to at least a portion of the first DC voltage.

53. The method of claim 47, where converting the first DC voltage to a second DC voltage comprises galvanically isolating the first DC voltage from the second DC voltage.

54. The method of claim 47, where the input voltage is un-rectified AC input voltage, and the input current is un-rectified AC input current.

55. The method of claim 47, where the input voltage is rectified AC input voltage, and the input current is rectified AC input current.